

WHAT IS CLAIMED IS:

- 1 1. A unitary insert for a cavity in a valve body, the insert comprising:
2 a check valve,
3 an anti-cavitation valve, and
4 a pressure relief valve.

- 1 2. The insert of claim 1, wherein the insert has a longitudinal axis, a first end
2 and a second end, and further wherein the first end includes a circular
3 sealing surface coaxial with the longitudinal axis and configured to engage
4 a mating coaxial circular sealing surface defined on an inner surface of the
5 valve body cavity.

- 1 3. The insert of claim 2, wherein the anti-cavitation valve further includes a
2 first pair of coaxial mating surfaces defining therebetween a first flow path
3 that opens under cavitation conditions.

- 1 4. The insert of claim 3, wherein the pressure relief valve includes a second
2 pair of coaxial mating surfaces that defines therebetween a second flow
3 path that opens under over-pressure conditions.

- 1 5. The insert of claim 4, wherein the anti-cavitation valve further includes an
2 anti-cavitation spring disposed to bias the first pair of mating surfaces
3 together.

- 1 6. The insert of claim 5, wherein the pressure relief valve further includes a
2 relief spring disposed to bias the second pair of mating surfaces together.

- 1 7. The insert of claim 6, wherein the first and second springs are coaxial.

- 1 8. In a valve for directing the flow of fluid both to and from a hydraulic
2 actuator, the valve having a valve body having a first cavity configured to
3 receive a valve insert, the first cavity having a cylindrical inner surface and

4 a bottom and a spool disposed in the valve body and configured to direct
5 the flow of hydraulic fluid both from a source of hydraulic supply to an
6 outlet port, and from the outlet port to a hydraulic tank, the improvement
7 comprising:

8 an insert disposed in the first cavity, the insert including an anti-
9 cavitation valve, a check valve and a pressure relief valve

1 9. The valve of claim 8, wherein the insert is disposed within the valve body
2 to move axially within the cavity, and by such motion to function as the
3 check valve.

1 10. The valve of claim 9, wherein the insert includes a shell and a valve
2 assembly inside the shell, wherein the valve assembly is disposed to move
3 axially with respect to the shell, and by such motion to reduce cavitation at
4 the outlet port.

1 11. The valve of claim 10, wherein the valve assembly includes a poppet and a
2 poppet seat, and further wherein the poppet is disposed to move with
3 respect to the poppet seat to function as the pressure relief valve.

1 12. The valve of claim 9, wherein the anti-cavitation valve includes a first seat
2 disposed on an inner surface of the insert body and a second seat disposed
3 on an annular ring of a valve assembly disposed within the insert body and
4 configured to seal against the first seat.

1 13. The valve of claim 12, wherein the valve assembly includes a poppet
2 having a third seat and wherein the annular ring has a fourth seat and
3 further wherein the third and fourth seats are disposed to seal against each
4 other.

1 14. The valve of claim 13 further including a first spring disposed to move the
2 insert axially to function as a check valve.

1 15. The valve of claim 14, further including a second spring disposed within
2 the insert body to move the valve assembly axially within the insert body
3 such that the first and second seats are sealed against each other.

1 16. The valve of claim 15, wherein the valve assembly further comprises a
2 third spring disposed to bias the poppet's third seat against the annular
3 ring's fourth seat.